



Survivability Concepts

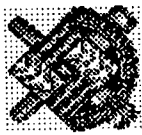
Jerry L. Chapin

Director

**Tank Automotive Research,
Development and Engineering Center**

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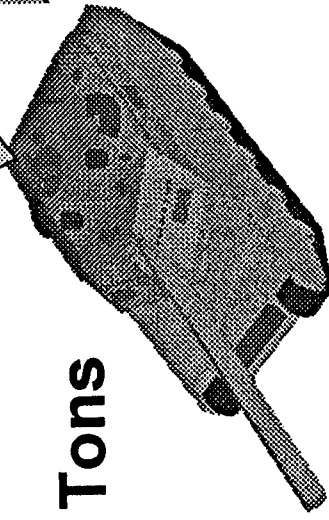
The Survivability Challenge

70 Tons

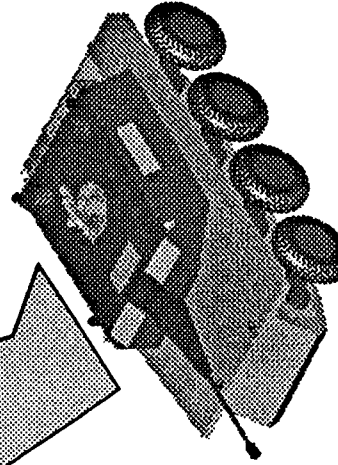


How can we increase the deployability and sustainability of our forces without compromising survivability and lethality?

40 Tons

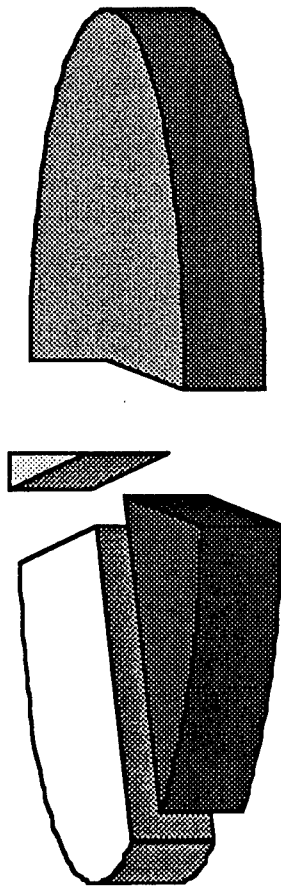


20 Tons





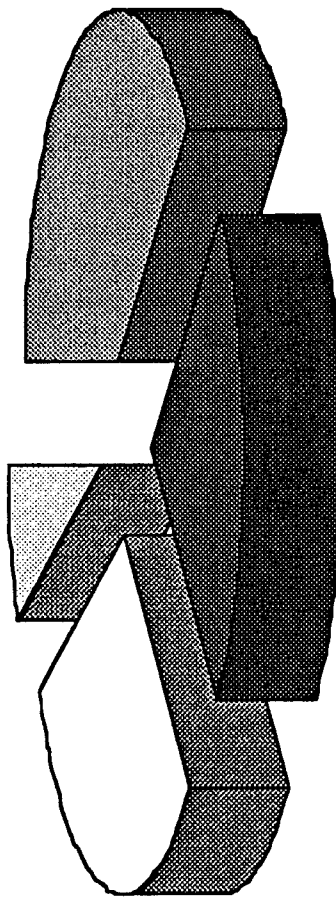
Future Survivability must be Lighter!



70 ton vehicle--

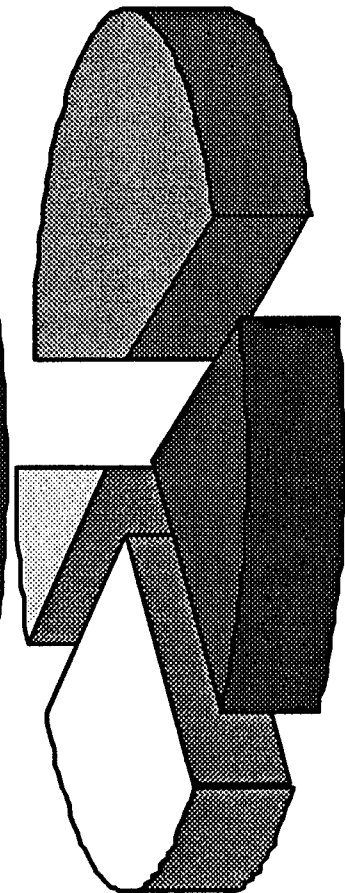
36 tons for structure
& protection

☒ Structure &
Protection
☒ Lethality
☐ Mobility
☐ Other



40 ton vehicle--

15.5 tons for
structure & protection



20 ton vehicle--

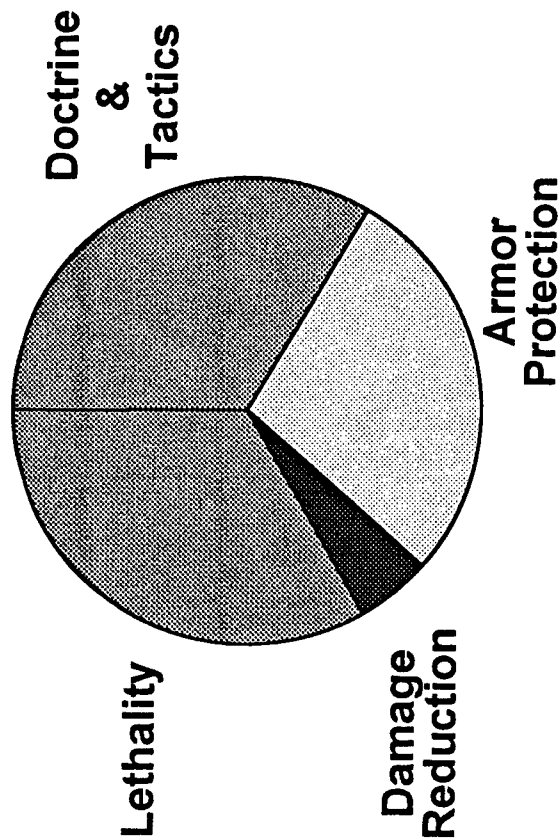
8.6 tons for structure
& protection!

3

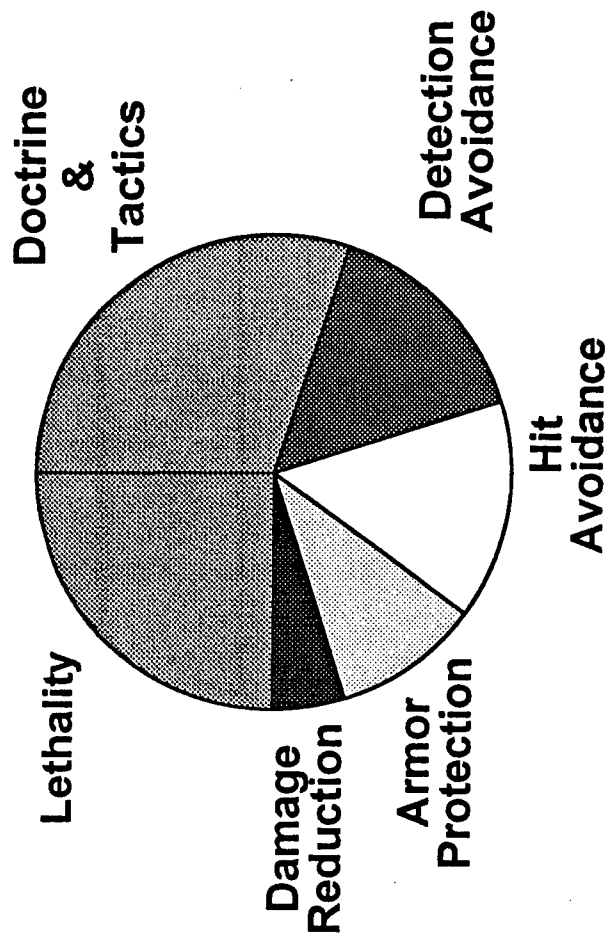


New Technologies must be used

The Past



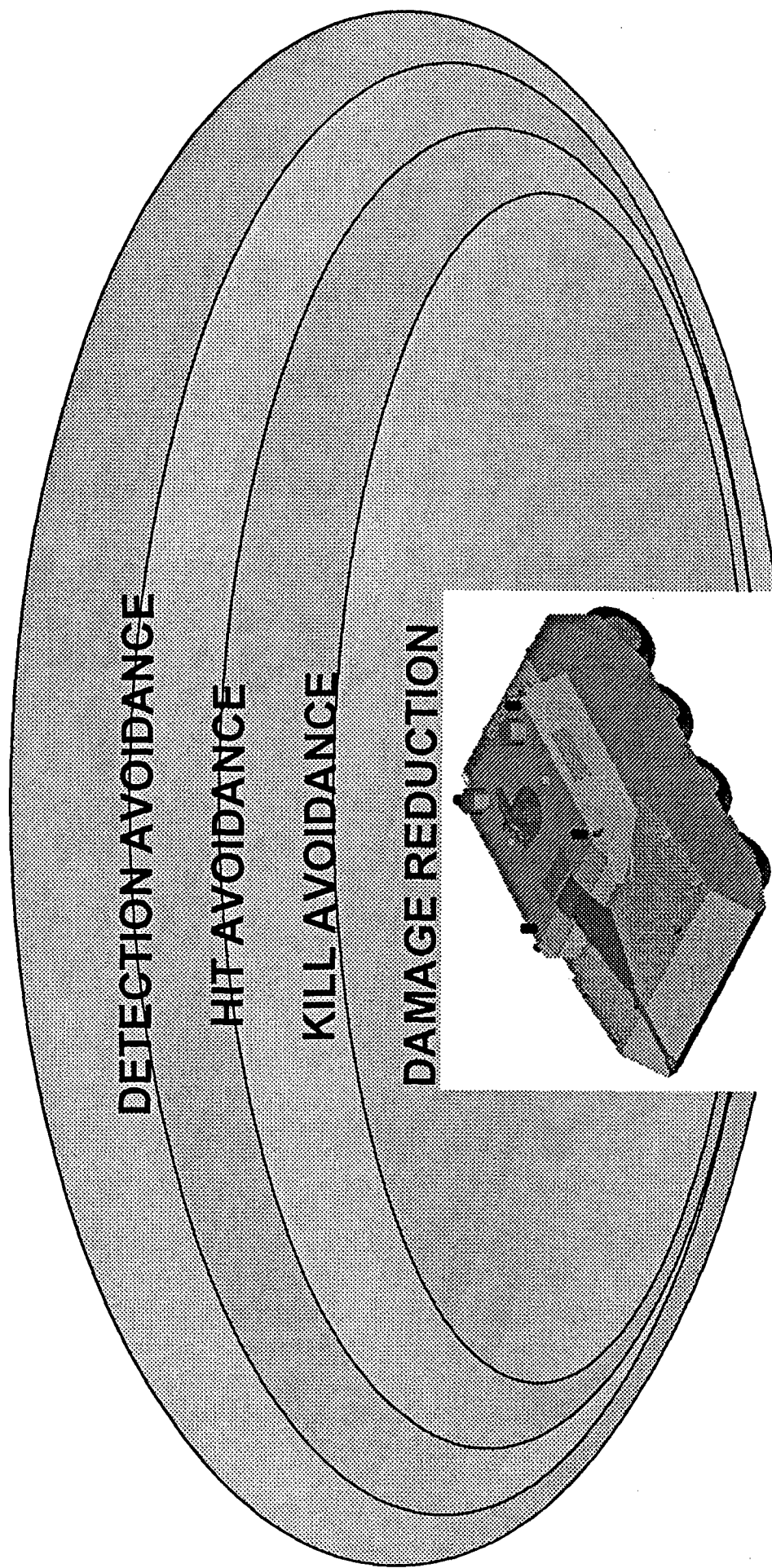
The Future

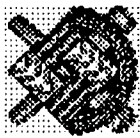


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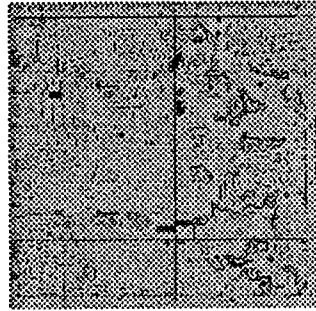
A Balanced, Layered Approach



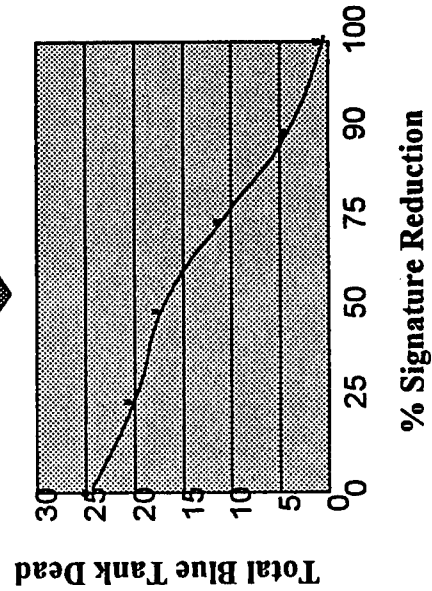
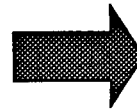


The Contribution of Signature Management

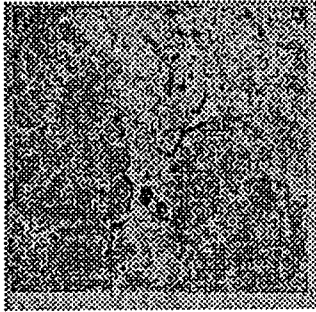
HRS 29.6 SWA



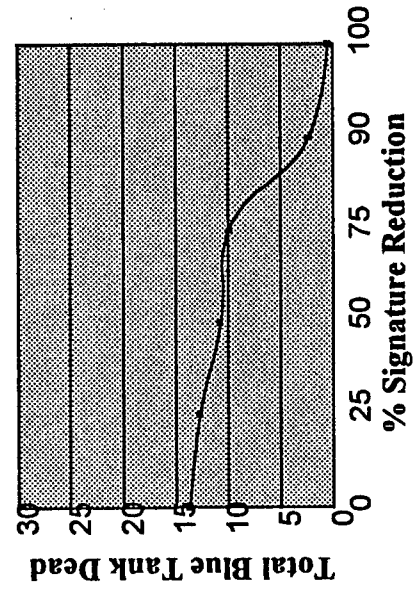
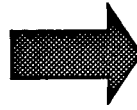
- Southwest Asia
- Meeting Engagement
- 1999 Blue Tank Hvy Brigade vs. 2004 Tank Bde
- Summer Day
- Visibility 10 km



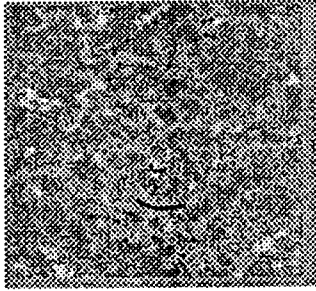
HRS 31 NEA



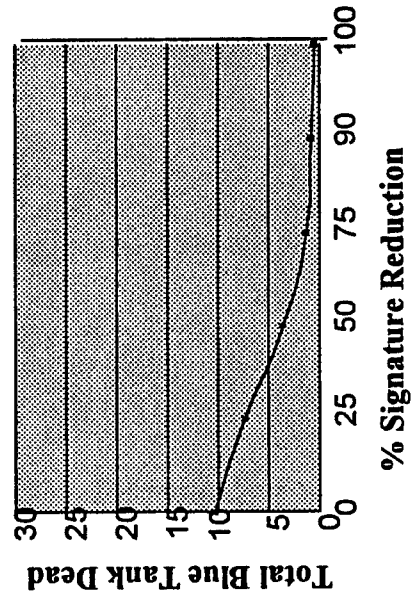
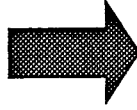
- North East Asia
- Hasty Blue Attack
- 1999 Blue Brigade vs. 2004 Armor Bde
- Winter Day
- Visibility Poor ~2km



HRS 35 EUR



- Central Europe
- Deliberate Defense
- 1999 Blue Balanced Task Force vs. 2004 Tank Regiment
- Summer Day
- Visibility 7 km

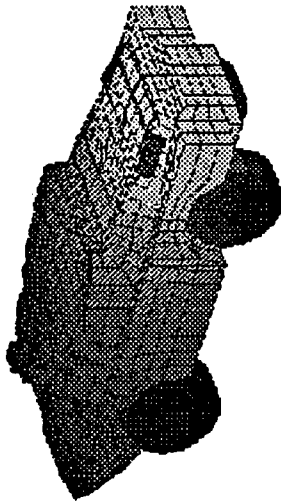




Signature Management

Signature Modeling & Hardware Design

**Thermal Predictive
Modeling**



**Radar Predictive
Modeling**



Hardware Performance Testing

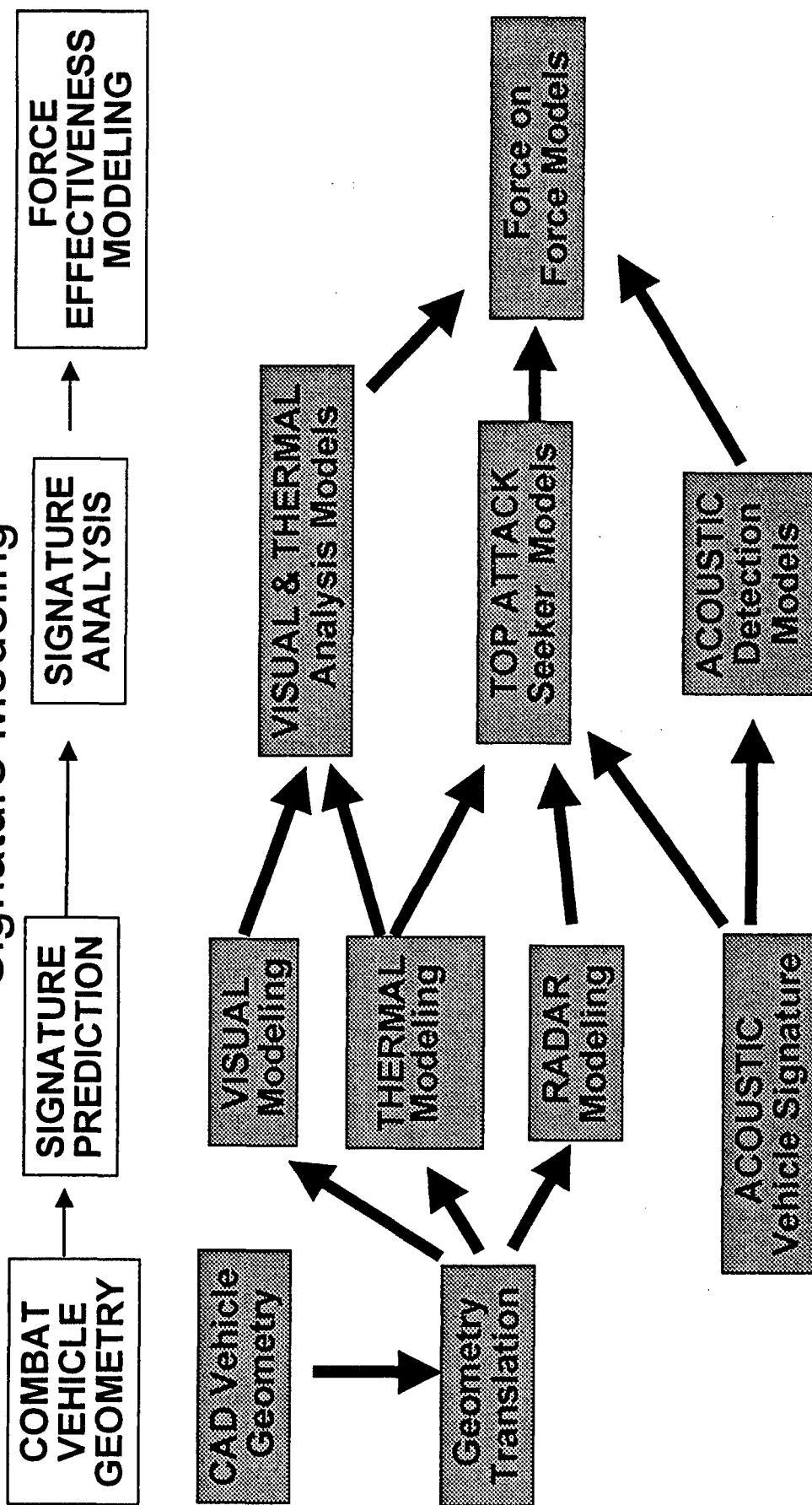


Committed to Excellence



Signature Management

Signature Modeling

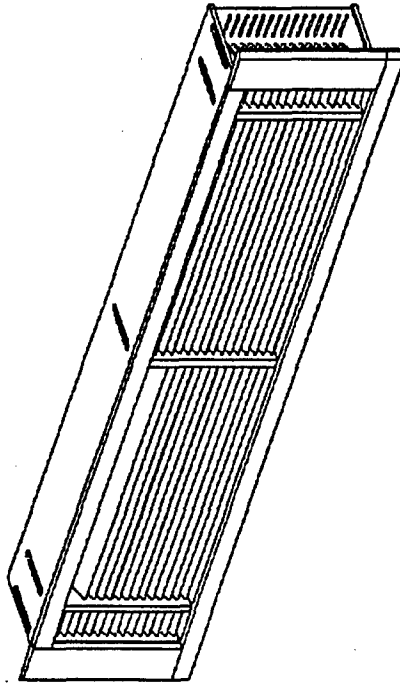




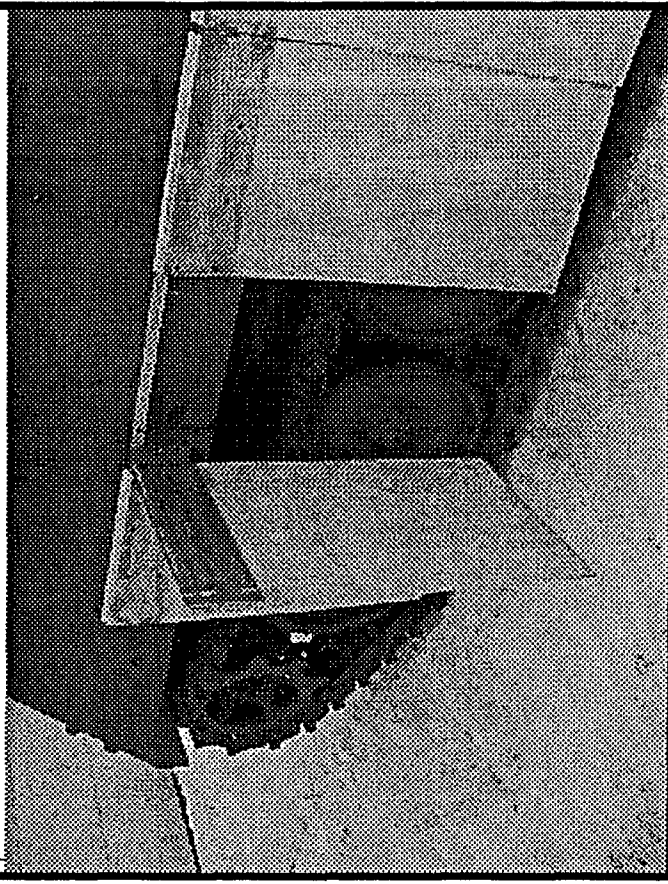
Signature Management

Hardware Integration

**Ballistic Grilles with Signature
Suppression**



Track Skirt Designs



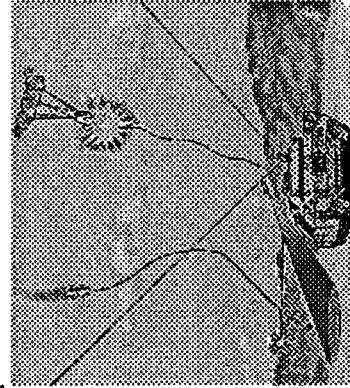
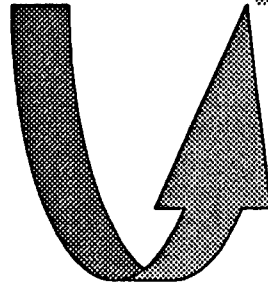
Committed to Excellence



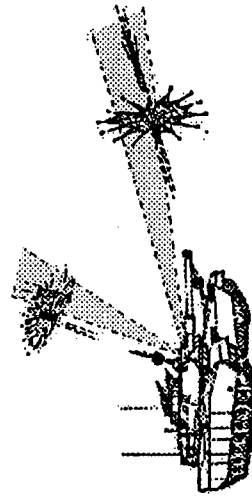
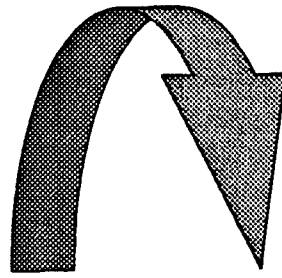
Hit Avoidance

The role of Hit Avoidance is to degrade the performance and hit probability of the threat weapon. It includes both Electronic warfare and Active Protection elements.

Hit Avoidance



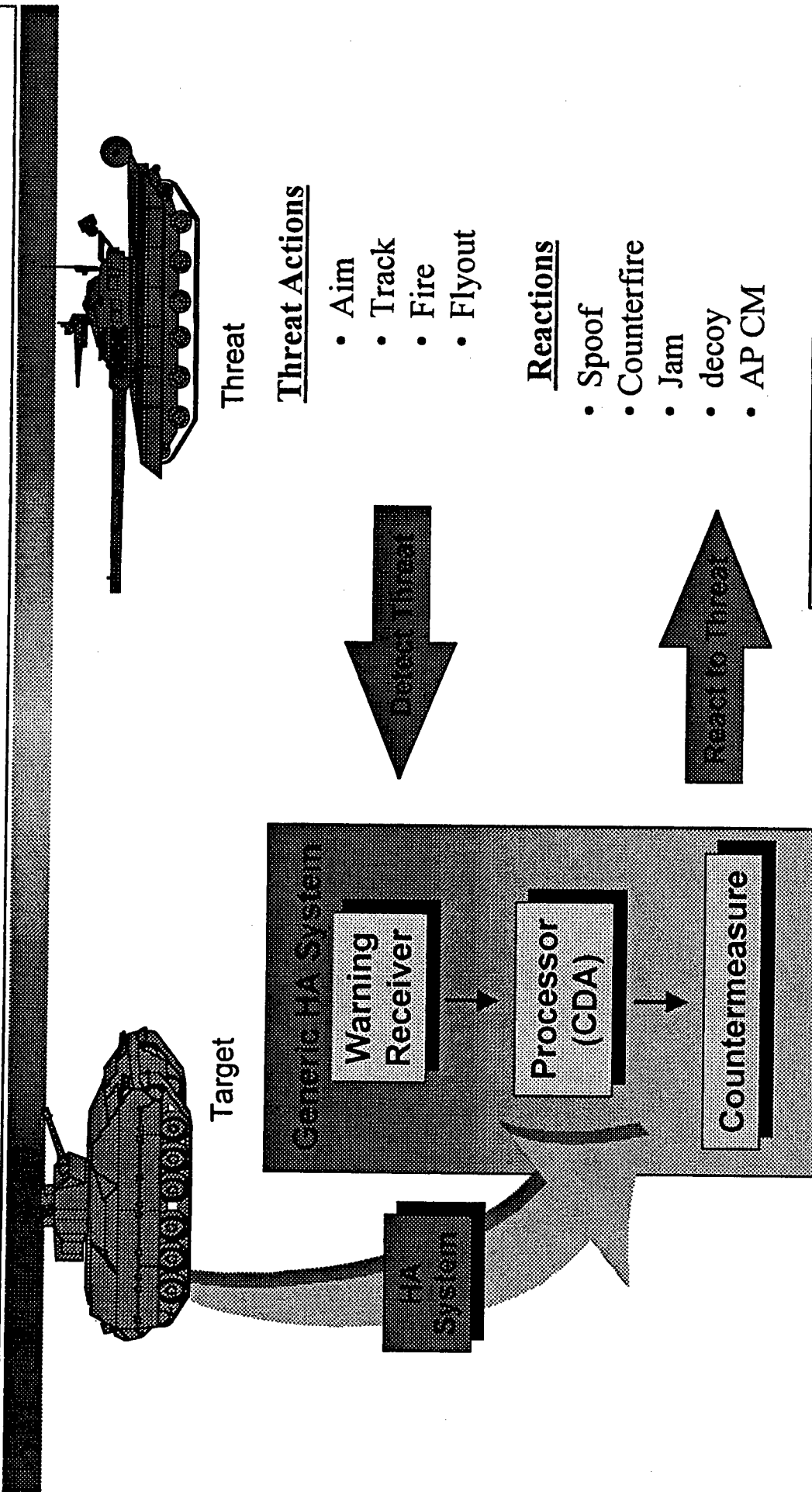
Electronic Warfare



Active Protection



Generic Hit Avoidance

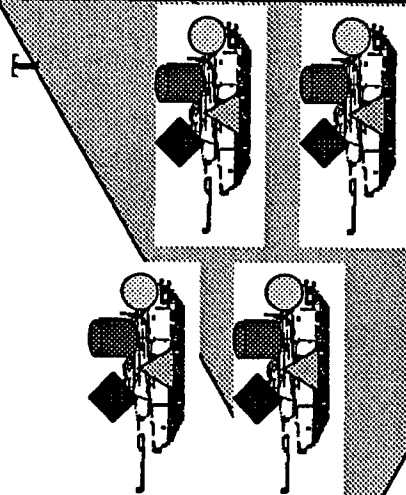
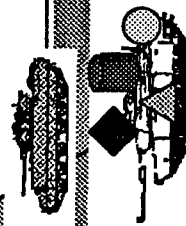


**Increase vehicle survivability
without using armor**

20



Hit Avoidance Continuum

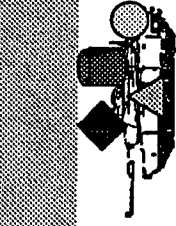


POINT DEFENSE

Each Vehicle provides its own protection

SELECTED DEFENSE

Particular vehicle classes are provided self protection



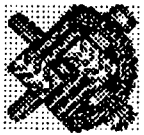
AREA DEFENSE

HA assets are allocated to a single vehicle to protect the battle unit

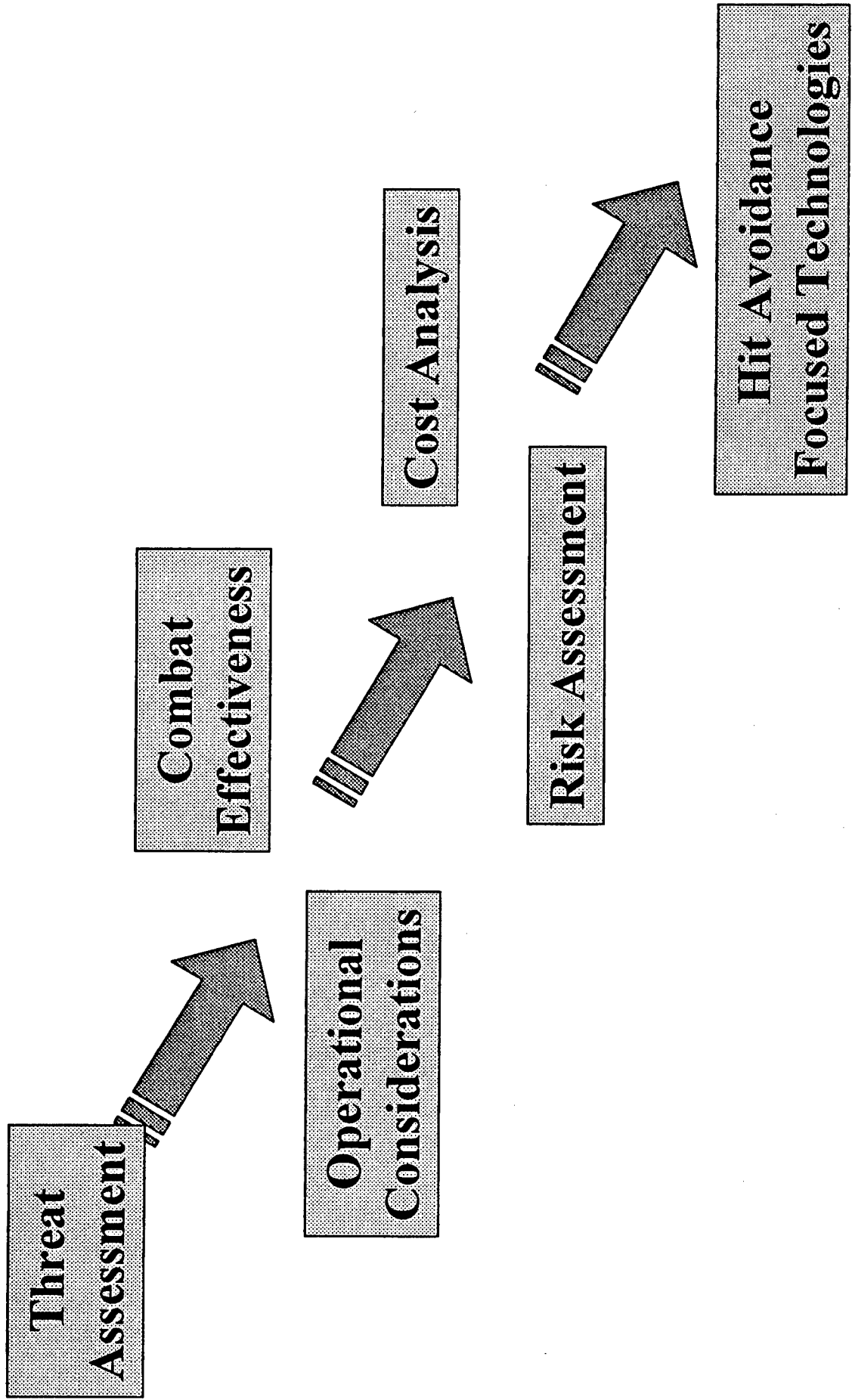
DISTRIBUTED DEFENSE

HA assets are allocated throughout a battle unit to provide protection through communication



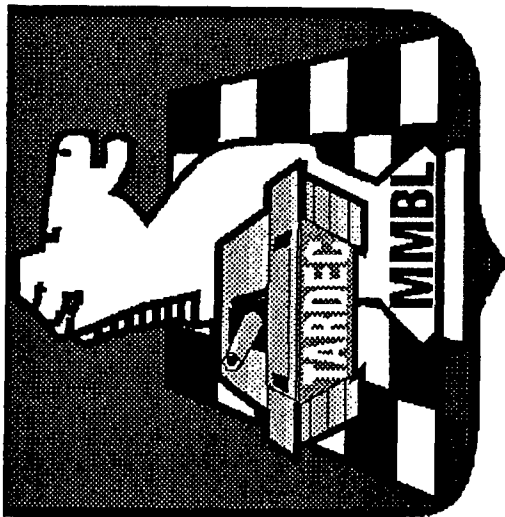


Hit Avoidance Study Process





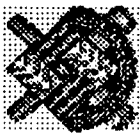
Hit Avoidance Affordability



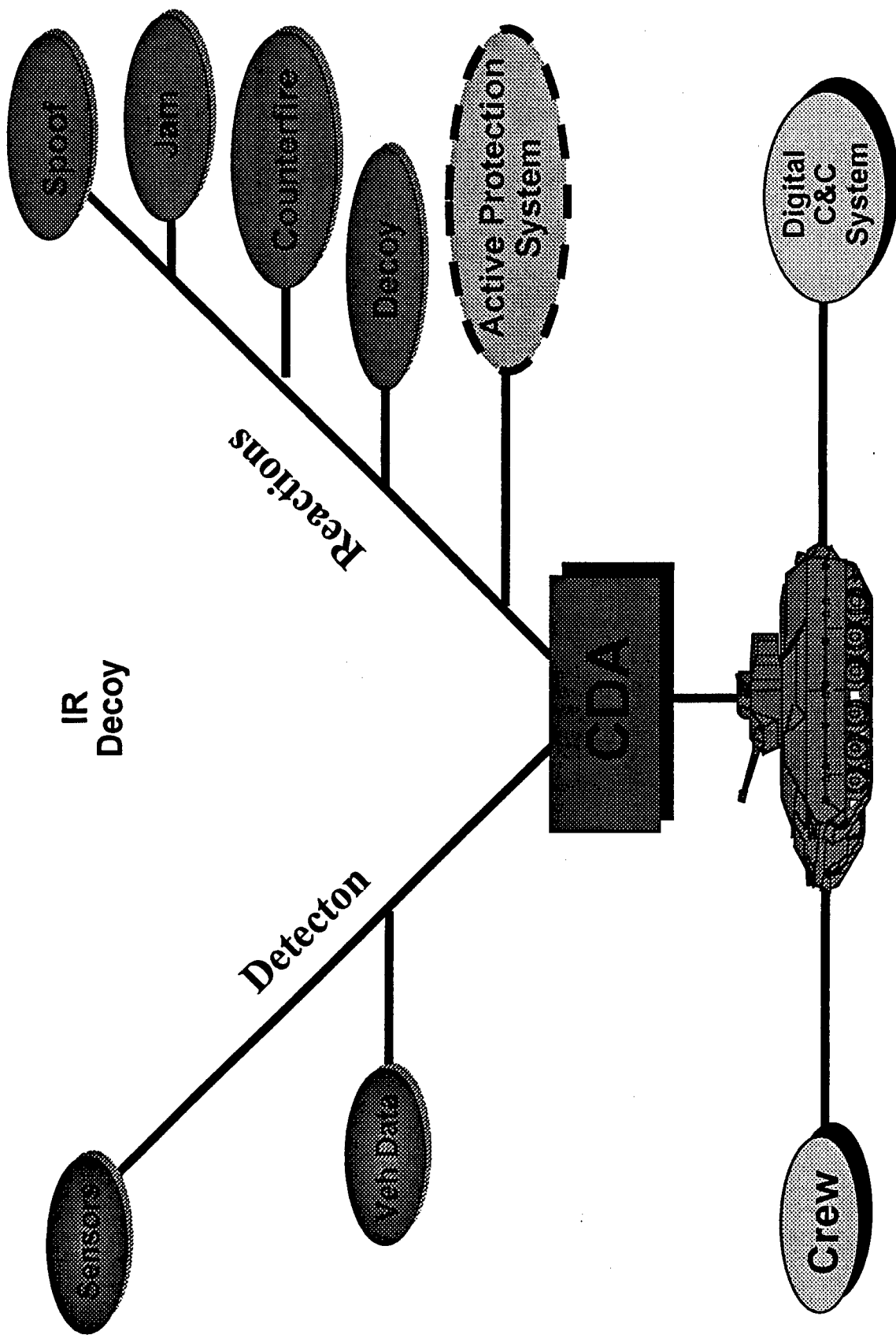
- Combat Worth
- Cost
- Risk



- EW has the potential Focus on Recommended Investment
- AP provides protection at an affordable cost



The "Full" EW Suite

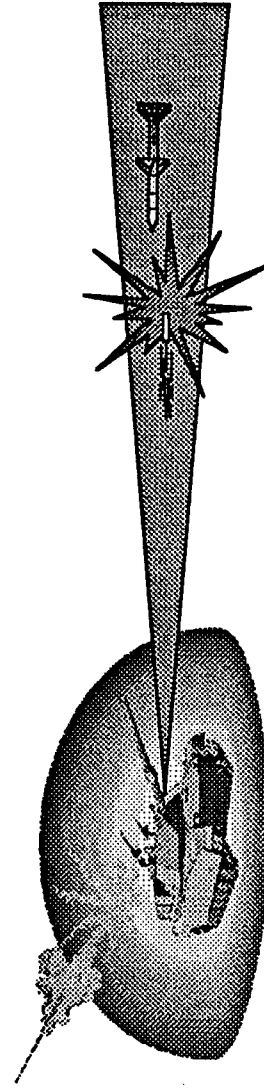


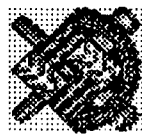


Hit Avoidance Active Protection Investigation

Kill Mechanisms Identified:

- Fuel Air Explosive
- Fragmentation
- Net
- Airbag





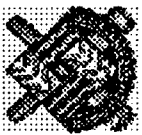
Integration Issues

Affordability
Optimal Suites
Cost & Operational Effectiveness

Component Integration
Field of View/Regard
Multisensor Correlation
Vehicle Interface

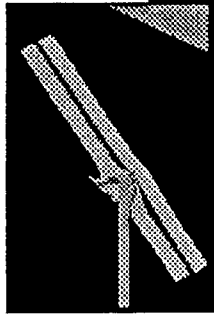
Fratricide / Collateral Damage

Signature / Armor Integration



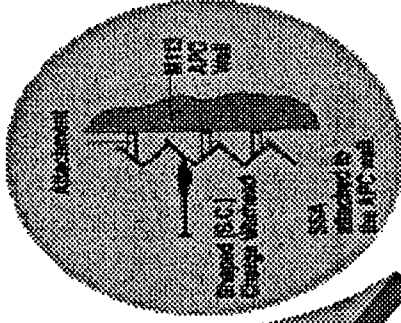
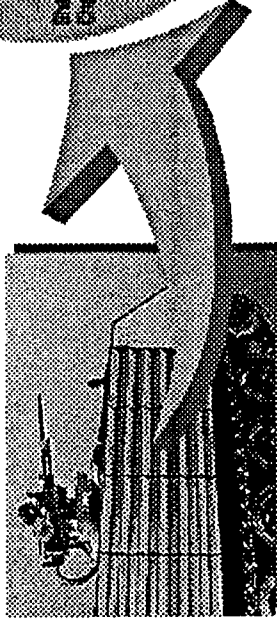
ARMOR TECHNOLOGIES

EXPLOSIVE REACTIVE ARMORS



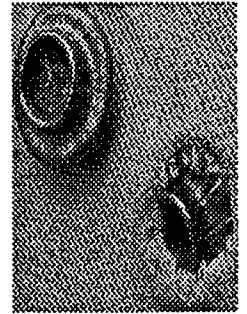
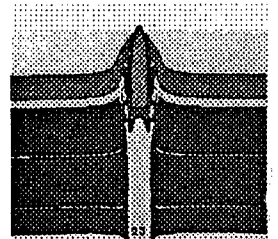
SPACED ARMORS

- Metal Plates
- Tipping Plates

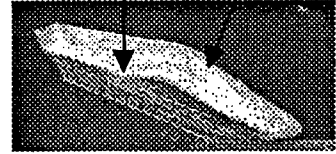


COMPOSITE ARMORS

- Metal Laminates
- Ceramic/Metal Composites
- Ceramic/Glass RP Composites



FRAGMENTATION PROTECTION ARMORS

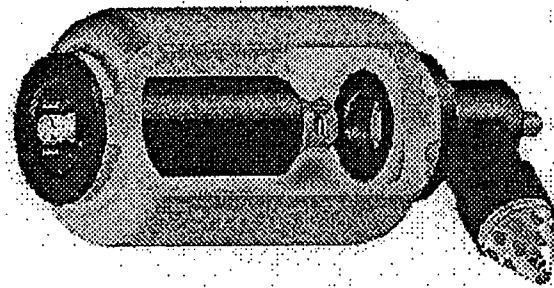
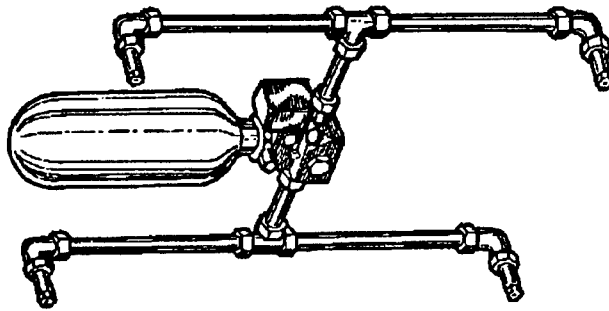
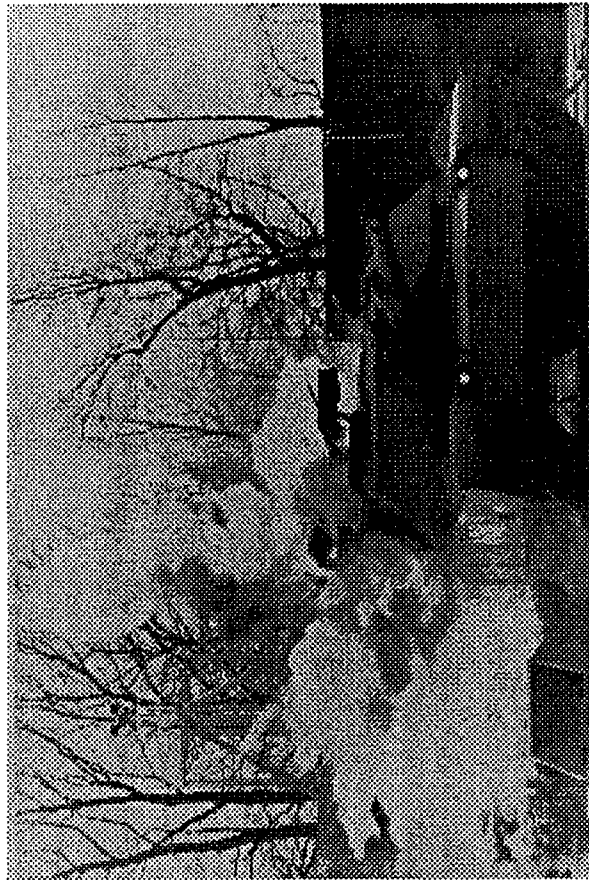


ASTM 44103C Stainless Steel,
(0.10 inch thick), Rockwell Hardness 50,
wrapped in 3 layers of lightweight ballistic
nylon

23 layers Lightweight
Ballistic Nylon (MIL-C-12369F)



Damage Reduction/Fire Suppression



15



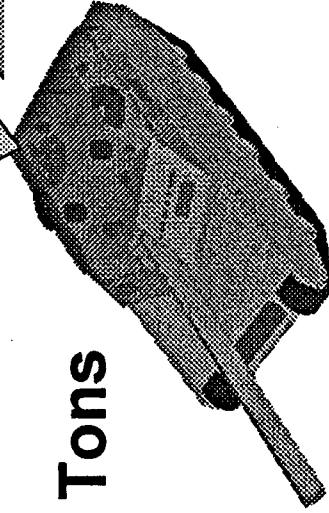
The Survivability Challenge

Through the use of these new technologies and integration techniques we can provide survivability to the lighter forces of the 21st century!

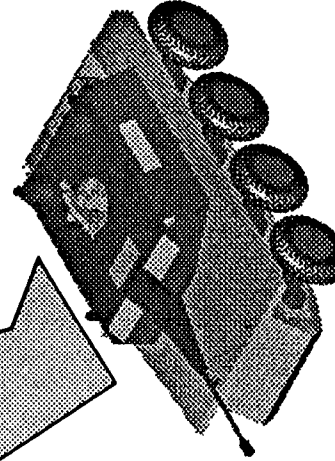
70 Tons



40 Tons



20 Tons



20

OPSEC REVIEW CERTIFICATION

(AR 530-1, Operations Security)

I am aware that there is foreign intelligence interest in open source publications. I have sufficient technical expertise in the subject matter of this paper to make a determination that the net benefit of this public release outweighs any potential damage.

Reviewer: James L. Thompson GM-15 Associate Director
 Name Grade Title
James L. Thompson 7 January 00
 Signature Date

Description of Information Reviewed:

Title: Survivability ConceptsAuthor/Originator(s): TARDEC (AMSTA-TR-R/263)Publication/Presentation/Release Date: 14 January 2000Purpose of Release: Briefing Presentation by Mr. Chapin at GDLS meeting with foreign guests

abstract, summary, or copy of the information reviewed is available for review.

Reviewer's Determination (check one)

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2. Unclassified Limited, Dissemination Restrictions IAW _____
3. Classified. Cannot be released, and requires classification and control at the level of _____

Security Office (AMSTA-CM-XS):

Concur/Nonconcur

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Date

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